



## New population records of an Endemic plant- *Melhanian magnifolia* Blatt. & Hallb. from Todgarh-Raoli wildlife sanctuary, Rajasthan

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### General Note

 Article is recommended to print as color digital version in recycled paper.

### ABSTRACT

*Melhanian magnifolia* Blatt. & Hallb., a beautiful orange-yellow flowered, stellately tomentose under shrubs, is rare. It is considered endemic to Rajasthan (India), with only small numbers reported in wild and reported from Jodhpur, Barmer, Pali and Ajmer. This study reports, new distributional sites from rocky area with sixty individuals about 35 km far from type locality (GuariKund, Rajsamand) in the buffer zone of Todgarh-Raoli wildlife sanctuary, Rajasthan. Present paper deals with finalize IUCN status using Criteria A to Criteria E, Ecological Niche modelling for habitat suitability were discussed along with photo plate, AOO & EOO map and distribution map in the communication.

**Keywords:** Melhanian, Endemic, new population, IUCN status.

## 1. INTRODUCTION

The genus *Melhania* Forssk. (Malvaceae: Tribe Sterculioideae) comprises c. 50 species (Mabberley, 2008) with distribution in Asia, Africa and Australia. In India, it is represented by 7 species (Malick, 1993), four of them *M. denhamii*, *M. futteyporensis*, *M. hamiltoniana* and *M. magnifolia* are reported from Rajasthan.

Blatt. & Hallb. (1918) proposed a new species *Melhania magnifolia* without designating type, collected from rocky area near Kailana and Osian, Jodhpur. Further, Santapau (1959) designated a lectotype of Blatt. & Hallb.'s specimen (7285), collected in November 1917.

While working on Floristic diversity of Todgarh-Raoli wildlife sanctuary, Rajasthan during 2015 – 2018, one of the authors demarcated a population of 50 – 60 individuals at four new localities [GuariDham (Rajsamand district); Bhagmal, Ronda, Mangadji temple (Ajmer district)] and collected herbarium samples of *Melhania* with longer bracts than sepal and orange-yellow flower. After critical study, scrutiny of literature (Jahre, 1866; Blatt. & Hallb. 1959; Bhandari, 1990; Shetty & Singh, 1991; Singh & Singh, 2006) and herbaria (BSJO, BSA, RUBL, JAC), it is identified as *Melhania magnifolia* Blatt. & Hallb. It is also noticed that earlier, this species was reported from type locality and nearby area with typical rocky, gravelly habitat.

A quadrate (10 × 10 m) study was undertaken and placed 5 quadrates beside each other on both the localities. Based on its typical habitat and small population size assumed that this species is Critically Endangered (CR). On the basis same typical habitat on both the localities, Ecological Niche Modeling was carried using MAXENT software to assess habitat suitability of this species.

*Melhania magnifolia* Blatt. & Hallb. in Journ. Bomb. Nat. Hist. Soc. 26: 228. 1918. Bhandari, Fl. Ind. Desert 71, 1990. (Fig. 1).

A woody, erect, somewhat spreading undershrub. Stem grey, stellate-downy, terete. Leaves 7–11 × 3–5 cm, narrowly lanceolate to ovate-oblong caudate or roundish at base, obtuse to subacute at apex, margins irregularly crenate or crenate-dentate, densely stellate-velvety above, white woolly tomentose beneath, 7-nerved. Petioles 2–3 cm, stellately grey, downy. Stipules ca 5 mm long, filiform, tomentose. Peduncles axillary and terminal, cinerea-tomentose, 4–5 cm long, 1–5 flowered. Pedicels 10–13 mm long; involucral bract 3, 12–14 × 4–9 mm, persistent, cordate, broadly ovate, acuminate. Sepals 1.3 cm long, ovate-lanceolate, tomentose outside, glabrous inside. Petals 5, orange-yellow, 1.5–2 × 1–1.5 cm, obovate, glabrous, veined. Stamens 5, 9–10 mm long alternating with ca 2 cm long staminodes. Ovary 5 mm in diam., hairy; styles 1.5 cm long with stigmatic branches. Stigma 5, a subglobose; Capsule 1–1.5 cm in diameter, densely tomentose, calyx persistent. Seeds 4–5 in each locule, more or less rhomboid, rugose, angular, minutely dark blistered throughout.

### Flowering & Fruiting:

July – November.

### Specimen examined:

INDIA: Rajasthan, Todgarh-Raoli wildlife sanctuary, Ronda Raoli Range, Bagmal, 29.07.2016, C.S. Purohit 32914 (BSJO);

### Ecology:

This species is having typical habitat (arid to semi-arid rocky) and occurs in rocky-gravel areas in Core zone of Todgarh-Raoli wildlife sanctuary, Rajasthan associated with *Ziziphus nummularia* (Burm.f.) Wight & Arn., *Salvadora oleoides* Decne., *Grewia tenax* (Forssk.) Fiori, *Tribulus rajasthanensis* Bhandari & V.S. Sharma. Quadrate data of *Melhania magnifolia* resulted in its co-dominant status in nature with RIV- 21.29.

### Distribution:

INDIA: Rajasthan, Jodhpur (Kailana, Osian), Ajmer (Bhagmal, Ronda, Mangadji temple, Nasirabad), Barmer (Chauhtan), Pali (Ranakpur) and Rajsamand (GuariDham) Endemic and Endangered. (Fig. 2)

### Notes:

*Melhania magnifolia* is closely allied to its other species *hamiltoniana* but differs in having orange-yellow flower and bracts without recurved margins. It is observed that the population of this species in nature is about 50 – 60 individuals on both the localities (Fig. 3).



**Fig. 1 - *Melhania magnifolia* Blatt. & Hallb. (Family: Sterculiaceae). Fig. shows close up of flowers; leaves dorsal & ventral side; fruits; and seeds**

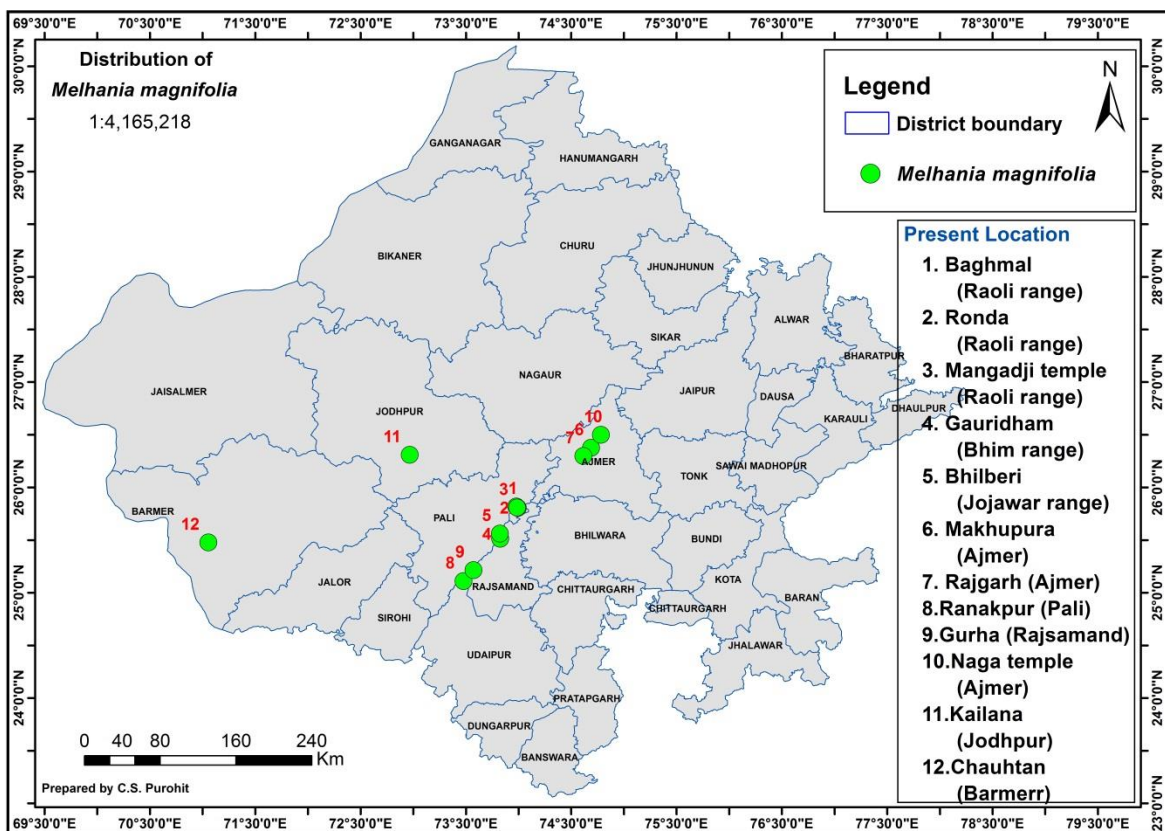


Fig. 2- Map shows distribution of *Melhanian magnifolia* in Rajasthan

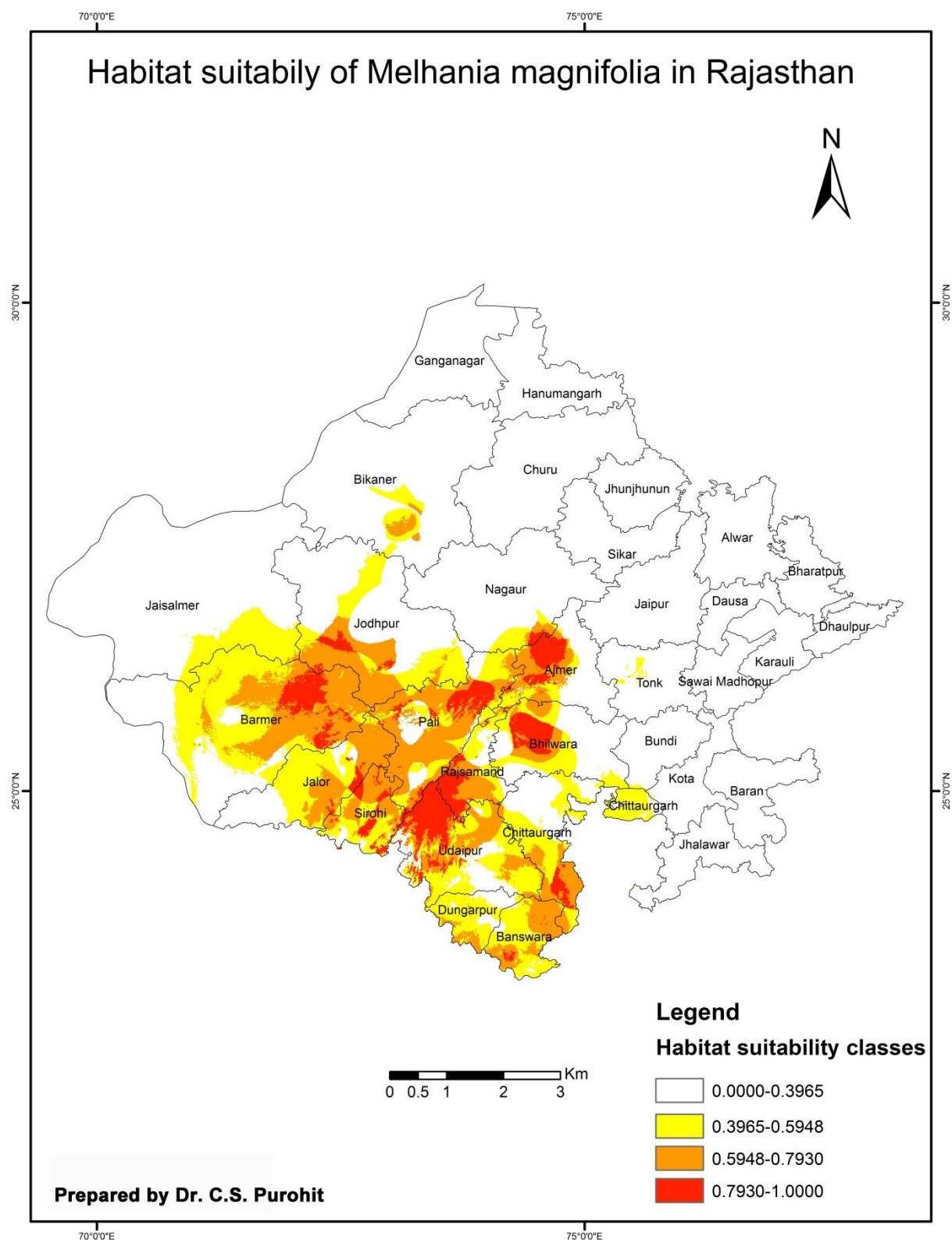


Fig. 3- Natural location of *Melhanian magnifolia* at Mangadji Temple, Ajmer

**Threats:** The main threat to this species is rapid innovation of *Prosopis juliflora* in its natural habitat. Other threats are urbanization and uncontrolled stone mining. Thus biotic pressure, its special habitat and harsh climatic factors, all potential limits spread and result in making it an endangered species.



**Conservations measures taken:** During the course of field exploration, we were able to locate it only one locality in Todgarh-Raoli wildlife sanctuary. Its seeds were collected in July, 2016. After shade dried, 30 seeds were sown in polythene bags with soil and Farm Yard Manure mixture. Only two seeds were germinate in garden but sudden temperature fluctuation and change of climatic condition, these seedlings died. Its need to further work on ex-situ conservation of this plant.



**Fig. 4-** Map shows Habitat suitability of *Melhanian magnifolia* in Rajasthan

**Habitat suitability:** On the basis same typical habitat on both the localities, Ecological Niche Modeling was carried using MAXENT software to assess habitat suitability of this species. It revealed that distribution of this species is restricted around Todgarh-Raoli wildlife sanctuary due to predicted relevant habitat as shown. The predicted suitable locations are Kailana (Jodhpur), Viratramata (Barmer), Todgarh-Raoli Wildlife sanctuary, Hills/rocky area (Udaipur) for reintroduction of this species (Fig. 4).

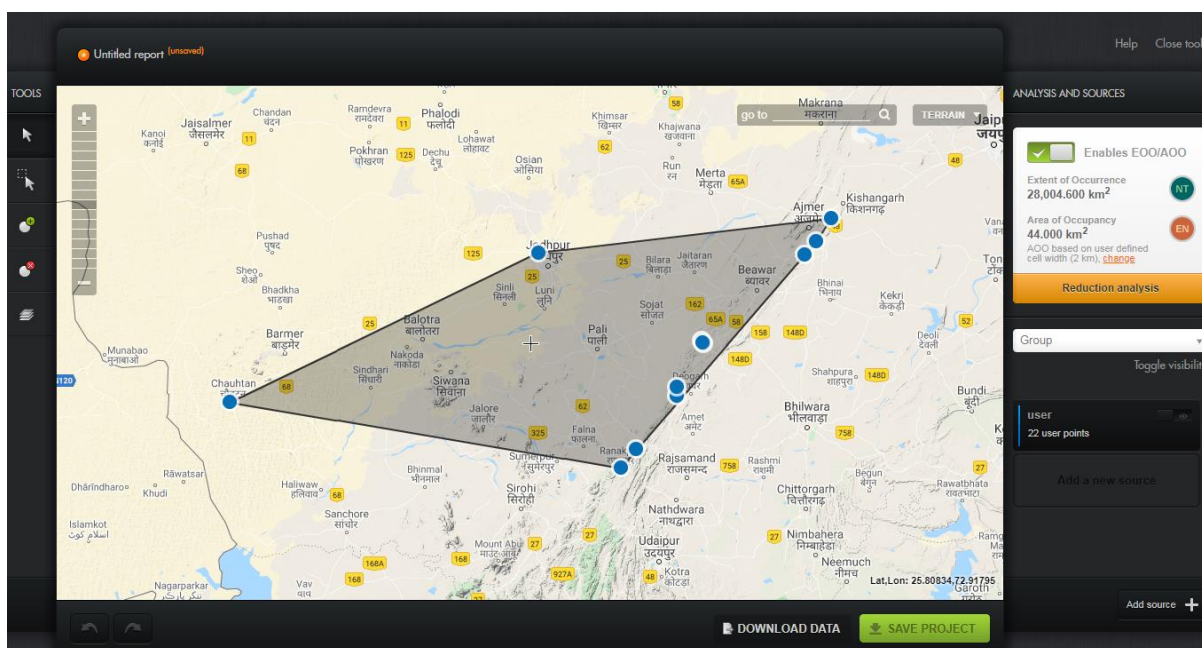


Fig. 5 - Shows Convex hull of occurrence points for analysis of EOO and AOO using GeoCat

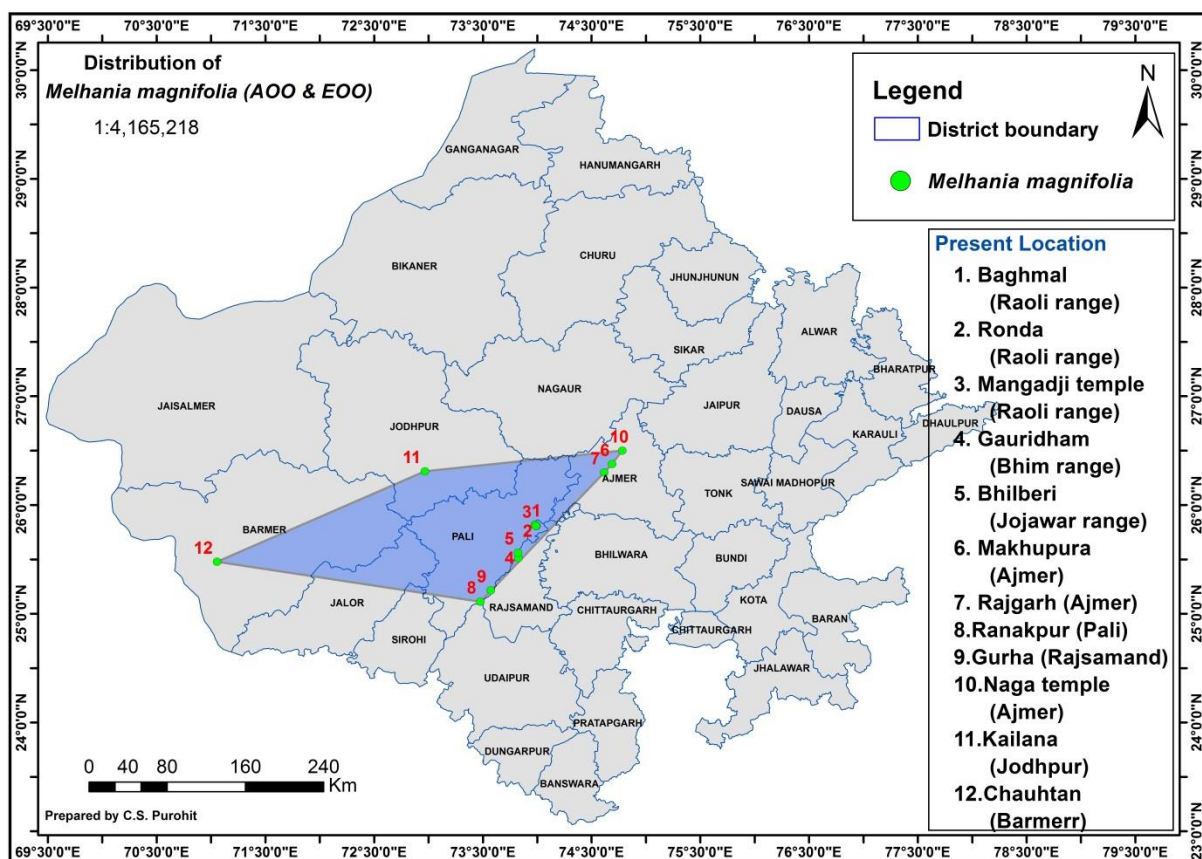


Fig. 6 - Map shows EOO (Extent of occurrence) of *Melhania magnifolia* in Rajasthan

**STATUS:** Based on our observations area of occupancy <500 km<sup>2</sup> (Fig. 5& Fig. 6) and population size < 250 with mature individuals (50 – 60 individuals) *Melhanian magnifolia* should be placed in the Endangered threat category of IUCN. This needs to be further confirmation.

This species has been found new distributional locations from Todgarh-Raoli wildlife sanctuary. Detailed survey of areas of occurrence confirmed its rarity. Hence its assessment using IUCN criteria placed it under the category Endangered [criteria- **En/B<sub>2</sub>ab(i, v); D<sub>1</sub> (IUCN version 3.1)**]. Therefore it needs immediate efforts to rehabilitate this species in nature.

#### SHEET OF IUCN CRITERIA-A

Use of the criteria A	Critically Endangered	Endangered	Vulnerable
<b>A. Population reduction</b>	Declines measured over the longer of 10 years or 3 generations		
<b>A1</b>	≥ 90%	≥ 70% ▪	≥ 50%
<b>A2, A3 &amp; A4</b>	≥ 80%	≥ 50% ▪	≥ 30%

**A1.** Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following

	Tick right sign.	others
<b>(a)</b> direct observation	▪	
<b>(b)</b> an index of abundance appropriate to the taxon	▪	
<b>(c)</b> a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality	▪	
<b>(d)</b> actual or potential levels of exploitation	▪	
<b>(e)</b> effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	▪	

**A2.** Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on and specifying any of the following

	Tick right sign.	others
<b>(a)</b> direct observation	▪	
<b>(b)</b> an index of abundance appropriate to the taxon	▪	
<b>(c)</b> a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality	▪	
<b>(d)</b> actual or potential levels of exploitation	▪	
<b>(e)</b> effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	▪	

**A3.** Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on and specifying any of the following

	Tick right sign.	others
<b>(a)</b> direct observation	▪	
<b>(b)</b> an index of abundance appropriate to the taxon	▪	
<b>(c)</b> a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality	▪	
<b>(d)</b> actual or potential levels of exploitation	▪	
<b>(e)</b> effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	▪	

**A4.** An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on and specifying any of the following

	Tick right sign.	others
<b>(a)</b> direct observation	▪	
<b>(b)</b> an index of abundance appropriate to the taxon	▪	
<b>(c)</b> a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality	▪	
<b>(d)</b> actual or potential levels of exploitation	▪	
<b>(e)</b> effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	▪	

IUCN Assessment

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## SHEET OF IUCN CRITERIA-B

Use of the criteria B	Critically Endangered	Endangered	Vulnerable
<b>B. Geographic range</b>	Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)		
<b>B1.</b> Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
<b>B2.</b> Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup> ✓	< 2,000 km <sup>2</sup>
<b>B1 OR B2. (a)</b> Severely fragmented, OR Number of locations	= 1	≤ 5 ✓	≤ 10

**B1 OR B2. (b)** Continuing decline in any of

	Tick right sign.	others
<b>(i)</b> extent of occurrence	✓	
<b>(ii)</b> area of occupancy	▪	
<b>(iii)</b> area, extent and/or quality of habitat	▪	
<b>(iv)</b> number of locations or subpopulations	▪	
<b>(v)</b> number of mature individuals	✓	

**B1 OR B2. (c)** Extreme fluctuations in any of

	Tick right sign.	others
<b>(i)</b> extent of occurrence	▪	
<b>(ii)</b> area of occupancy	▪	
<b>(iii)</b> number of locations or subpopulations	▪	
<b>(iv)</b> number of mature individuals	▪	

IUCN Assessment

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EN/ B<sub>2ab</sub>(i, v)

## SHEET OF IUCN CRITERIA-C

Use of the criteria C	Critically Endangered	Endangered	Vulnerable
<b>C. Small population size and decline</b>			
Number of mature individuals	< 250	< 2,500 ▪	< 10,000
<b>C1.</b> An estimated continuing decline of at least:	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
<b>C2.</b> A continuing decline	<b>(up to a max. of 100 years in future)</b>		
<b>C2. (a) (i)</b> Number of mature	< 50	< 250 ▪	< 1,000



individuals in each subpopulation			
<b>C2. (a) (ii)</b> % individuals in one subpopulation =	90–100%	95–100% •	100%
<b>C2. (b)</b> Extreme fluctuations in the number of mature individuals.			

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EN/ B<sub>2ab</sub>(i, v)

## SHEET OF IUCN CRITERIA-D

Use of the criteria D	Critically Endangered	Endangered	Vulnerable
<b>D. Very small or restricted population</b> √			
Number of mature individuals	< 50	< 250 √	<b>D1</b> < 1,000
<b>VU D2.</b> Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time			<b>D2.</b> typically: AOO < 20 km <sup>2</sup> or number of locations ≤ 5

IUCN Assessment

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EN/ B<sub>2ab</sub>(i, v); D<sub>1</sub>

## SHEET OF IUCN CRITERIA-E

Use of the criteria E	Critically Endangered	Endangered	Vulnerable
<b>E. Quantitative Analysis</b> •			
Indicating the probability of extinction in the wild to be	≥ 50% in 10 years or 3 generations (100 years max.)	≥ 20% in 20 years or 5 generations (100 years max.)	≥ 10% in 100 years

IUCN Assessment

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EN/ B<sub>2ab</sub>(i, v); D<sub>1</sub>**Funding:**

This research received no external funding.

**Conflicts of interest:**

The authors declare no conflict of interest.

**Peer-review:**

External peer-review was done through double-blind method.

**Data and materials availability:**

All data associated with this study are present in the paper.

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